PROCEDURES FOR DEVELOPING SCOPES OF WORK FOR

CONSTRUCTING A CHANNEL TO REDUCE FLOOD HAZARDS

January 2005

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK

PROCEDURES FOR DEVELOPING SCOPES OF WORK FOR CONSTRUCTING A CHANNEL TO REDUCE FLOOD HAZARDS

1. PURPOSE

The Federal Emergency Management Agency (FEMA) administers three grant programs to assist communities in mitigating the effects of natural hazards: the Flood Mitigation Assistance (FMA) Program, the Hazard Mitigation Grant Program (HMGP), and the Pre-Disaster Mitigation (PDM) grant program. State, Tribal, and local government agencies may apply through the States to receive funds for these programs. FEMA requires these applicants to meet a specific set of requirements when applying for the funds to ensure that proposed projects meet the program requirements, Federal environmental laws and regulations, and cost-effectiveness requirements.

The purpose of this document is to provide guidance for applicants applying for funding under FEMA's mitigation grant programs, including collection of the administrative and technical data FEMA requires as part of the grant review and approval process. This document is designed to compliment the FEMA electronic grants (e-Grants) management system accessible at:
https://portal.fema.gov/famsVu/dynamic/mitigation.html

By submitting the data described in Section 2, the applicant facilitates both State and FEMA review of the funding application. SOWs without the data may result in delays or a

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decline of project funding. An example application exhibiting the components described in this guidance is included. The information in the left column (Procedures) provides information on the format and requirements for an applicant to provide technical and other data in support of their request for funding. The right column (Sample Data) provides an applicant with examples of data and the presentation or format of the data that the State and FEMA will need to review during their evaluation of the application. Specific information regarding the administrative and eligibility requirements for mitigation programs is not presented here. Furthermore, this represents a summary of areas that should be covered in a SOW for a mitigation project application. Some areas can be significantly expanded via FEMA or other guidance for implementing specific programs and conducting an environmental review and a benefit-cost analysis (BCA) to determine cost-effectiveness. The State Hazard Mitigation Officer (SHMO) or FEMA Regional Office should be contacted for additional information. One method of reducing future damage from floods is for the community to construct a channel to increase conveyance and capacity, or modify an existing channel, to reduce flood hazards. (Throughout this document, general references to channel construction are intended to include both new construction and modifications to existing channels.)	

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2. DEVELOPING THE SCOPE OF WORK FOR A CHANNEL CONSTRUCTION PROJECT

One of the primary goals of FEMA's mitigation programs is to reduce future flood damage to existing development, particularly to structures that are insured under the National Flood Insurance Program (NFIP). To achieve this goal, FEMA may provide funding to communities for the reduction of flood hazards through channel construction. For this type of project, the community constructs a new channel or modifies an existing channel. Flood hazards are typically reduced by:

- Increasing channel storage or conveyance, usually by increasing the size of the channel cross section, increasing channel efficiency, or raising the channel banks;
- Directing floodwaters away from structures at risk, such as by re-aligning the existing channel or by moving the existing channel to a new location; or
- Eliminating flow constrictions, such as an undersized bridge opening, that causes backwater effects.

Such measures must be undertaken to reduce flood hazards to existing development. FEMA will not provide grant funding for reduction of flood hazards solely to areas that are currently vacant but would be subject to development once flood hazards are eliminated.

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Summary of Required Application Information When a community applies for funding for a channel construction project, the following information must be submitted with the application: 1. Basic applicant, contact, and community information. (Section 2.1). 2. Information regarding the applicable Hazard Mitigation Plan for the jurisdiction in which the project is being implemented. (Section 2.1). 3. Descriptions of the hazard, the problem, and the project. (Section 2.1). 4. Information regarding the effective Flood Insurance Study (FIS) and Flood Insurance Rate Map (FIRM); and additional hydrologic and hydraulic data necessary to identify the effects of the project. (Section 2.2). 5. Description of the decision-making process and evaluation of alternatives. (Section 2.3). 6. BCA and supporting documentation. (Section 2.4). 7. Detailed SOW, which includes a project description. (Section 2.5). 8. Sources of the Cost Share. (Section 2.6). 9. Schedule for completing the scope of work and for operating and maintaining the channel, once the work is completed. (Section 2.6)	The City has followed the FEMA Required Application Information checklist in providing and organizing the data to support the funding request.

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9. Schedule for completing the scope of work and for operating and maintaining the drainage/stormwater management system, once the work is completed. (Section 2.6). 10. Cost estimate. (Section 2.6). 11. Description of environmental considerations and supporting documentation. (Section 2.7). Internet Resources for Applicants The FEMA website (www.fema.gov) and the e-Grants portal (https://portal.fema.gov/famsVu/dynamic/mitigation.html) have a wealth of useful information to assist applicants through the funding request process. These include: • FEMA Mitigation Division, Education and Training (www.fema.gov/fima/education). • FEMA Mitigation Division, Mitigation Grant Programs, FMA, (www.fema.gov/fima/fma). • FEMA Mitigation Division, Mitigation Grant Programs, HMGP, (www.fema.gov/fima/hmgp). • FEMA Mitigation Division, Mitigation Grant Programs, PDM, (www.fema.gov/fima/pdm). • FEMA Mitigation Division, Best Practices and Case Studies, (http://www.fema.gov/fima/bp.shtm)	

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• Flood Hazards (www.fema.gov/hazards/floods) • Flood Hazard Mapping (www.fema.gov/fhm) • Floodplain Management (http://www.fema.gov/fima/floodplain.shtm) • FEMA Environmental and Historic (www.fema.gov/ehp) • FEMA BCA (http://www.fema.gov/txt/fima/guidelines_for_bca.txt) • FEMA BCA Helpline (toll free at 866-222-3580) or via e-mail at bchelpline@dhs.gov. • NRCS Stream Restoration Manual (www.nrcs.usda.gov/technical/stream_restoration)	

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2.1 STEP 1: OBTAIN BASIC PROJECT INFORMATION

The applicant must obtain the following basic information to apply for funds for a channel construction project:

- Information regarding the organization applying for the grant, including:
  - Legal status and function.
  - State and Federal employer tax identification numbers.
  - Program eligibility category - that is, State, Tribal, or local government, special government district, or eligible private nonprofit group or agency.
  - State and Federal legislative district information.
- Information for primary and alternate State and local contacts. Contacts for data clarification or additional data and all consultants should also be clearly identified.

Applicant: City of Adversity, located in Prosperity County in the State of Any State (AS).

State Employer Tax Identification Number: 4576-3456-7782

Federal Employer Tax Identification Number: 8897-5643-7743

Program Eligibility Category: Local government

Legislative Districts: 1st Congressional District; 2nd State Assembly District; 3rd State Senate District

Primary Local Point of Contact:

Taylor Gilmour	Job Title:	Director of City Services
City of Adversity, AS	Telephone:	(111) 711-0022
City Hall, Room 410	Fax:	(111) 711-0333
35003 Tornado Alley	Email:	tgilmour@adv.as.us
Adversity, AS 40009		

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Alternate Local Point of Contact:

James Koff	Job Title:	Chief Engineer
City of Adversity, AS	Telephone:	(111) 711-0045
City Hall, Room 312	Fax:	(111) 711-0335
35003 Tornado Alley	Email:	**jkoff@adv.as.us**
Adversity, AS 40009		

Primary State Point of Contact

Andrea Leonard	Job Title:	AS SHMO
Emergency Management Agency	Telephone:	(222) 822-4466
AS EMA, Room 11002	Fax:	(222) 822-1100
1734 Governor's Highway	Email:	**aeleonard@ema.as.us**
Capital City, AS 40028		

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	Alternate State Point of Contact: Susan Smith — Job Title: Senior EMA Planner Emergency Management Agency — Telephone: (222) 822-4456 AS EMA, Room 11002 — Fax: (222) 822-1100 1734 Governor's Highway — Email: sesmith@ema.as.us Capital City, AS 40028 **Application Preparer:** Philip Champagne — Job Title: Engineer II City of Adversity, AS — Telephone: (111) 711-0045 City Hall, Room 312 — Fax: (111) 711-0335 35003 Tornado Alley — Email: pchampagne@adv.as.us Adversity, AS 40009
• NFIP community name, Community Identification Number (CID), participation status, and compliance history.	**NFIP Community Name:** City of Adversity, located in Prosperity County in the State of Any State (AS); CID = 006006. **NFIP Participation Status:** Participating since June 1974. Last Community Assistance Visit conducted in January 2000.

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	Compliance History: The City has adopted the minimum floodplain management criteria required under the NFIP. Although uncontrolled construction of homes occurred prior to the establishment of the floodplain regulations, current enforcement of these regulations has eliminated construction of new or substantially improved homes in floodplains. The City's zoning includes buffers around floodplains and only allows for recreational or open space use within floodplains.
• Insurance information for properties insured under the NFIP, including claim amounts that will be protected by the project; and Repetitive Loss properties insured under the NFIP. Repetitive Loss properties are those that have experienced at least two claim payments of over $1,000 each within any 10-year rolling period. Loss dates within 10 days of each other are counted as a single claim. A primary focus for FEMA's mitigation programs is reduction of costs under the NFIP, particularly through the elimination of Repetitive Loss properties. The applicant may obtain repetitive loss information through the state.	Of the 20 residences in question, 12 are insured under the NFIP, and five of the insured properties are repetitive loss properties.
• Information clearly defining the location of the proposed project, including latitude and longitude. Attach mapping showing the location of the project. Acceptable formats include recent topographic mapping or aerial photographs, and U.S. Geological Survey (USGS) quadrangle maps. Also, note the existence of any deeds or restrictions that might limit Federal funding for the project.	The project is located in the southwestern section of the City of Adversity, adjacent to the Creekside subdivision. It will affect a 2,900-foot long reach of McDermott Creek. The downstream end of the project is located approximately 800 feet upstream of the creek's confluence with the Quake River (GPS coordinates = N49.2590, W122.7742). The upstream end of the project is located approximately 200 feet upstream of the 2nd Avenue bridge (GPS coordinates = N49.2687, W122.7810). The work will be completed within the drainage easement established for the existing channel when it was last modified (in the 1930s).

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	See attached FIRM (at same scale as original FIRM) and copy of local topographic map (based on an aerial survey from April 1997) with project site marked in red on each map.
• Identification of any FEMA grant funds previously received for the project. For example, if the facility was damaged during an event that the President declared to be a disaster, the applicant may have received a grant to repair the facility under the FEMA Public Assistance program.	The City has not previously received disaster assistance for repair or restoration of the channel or appurtenant features.
• A description of any projects or components of this project, whether funded by FEMA or another entity, that will be completed in the vicinity of the project. Other projects affecting the same watershed resources should be considered since FEMA must evaluate cumulative effects of projects when conducting the environmental review.	No other projects are currently projected for the McDermott Creek watershed.
• A description of the proposed mitigation project that is the preferred solution (i.e., Solution No. 1)	<u>Solution #1 (Preferred Solution)</u> The City proposes to replace the existing earthen channel with a lined rectangular channel for a reach 2,900 feet long between the limits of construction identified above. The modified channel will be built within the alignment of the existing channel. It will have a bottom width of 7 feet.

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• A description of the problem that will be solved through implementation of the channel construction project.	Twenty residential properties in the Creekside subdivision are located in the 100-year floodplain of McDermott Creek. These residences sustained more than 50 percent damage in the 2002 floods, are located the 100-year floodplain, and have sustained at least 10 percent damage in at least three other floods over the past 30 years. Five of the structures are located in the FEMA-designated floodway for McDermott Creek. In addition to the residences, an elementary school serving the community is partially located in the 100-year floodplain and sustained damage from a foot of water during the 2002 floods.
• A description of how the proposed channel construction project will solve the problem.	As described in the discussion of Executive Order 11988 below, the channel will reduce the 100-year flood elevation by an average of 1.5 feet, contain the 100-year flood through the project area, and reduce the width of the floodway. By implementing the channel modification project, the City of Adversity will remove floodprone residential structures from the floodplain and floodway, thereby eliminating future damage and health and safety risks for those homeowners and any potential rescuers. The project will also provide protection to the school, reducing the risk to students, the need for evacuation, the risk of damage, and the incidents of school closure. The project will also eliminate the need to provide emergency response services, subsidized flood insurance, and Federal disaster assistance to the residents. The channel construction will also bring cost savings to the NFIP.
• The scheduled completion date for the project.	The City anticipates completing the project by October 2006. This date assumes approval of the grant application by February 2005.

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• If applicable, community's Community Rating System (CRS) status and the status of the FMA plan. This information should include the date that FEMA approved the FMA plan and a reference of how this project is included in the plan.	The City does not participate in the Community Rating System and has not received a FMA grant for planning.
• If applicable, the status of the community's multi-hazard mitigation plan should be provided. If the community has a plan, but no recorded approval such as a letter from FEMA, a copy of the plan may be required.	The City is a signatory to the multi-jurisdictional plan prepared for Prosperity County. The City adopted the plan on July 1, 2003, and the plan was approved by FEMA on September 1, 2003. This plan includes a specific section addressing flood mitigation and repetitive loss properties.
• If the community has an approved multi-hazard plan, the application should reference how the plan recommends mitigating the problem.	The floodplain of McDermott Creek affects the Creekside subdivision and a school located within the subdivision. The July 1, 2003, multi-jurisdictional plan for Prosperity County referenced reduction of this flood hazard as one of the primary mitigation action items for the City of Adversity.
Additional information that will be required to support the project application is described below. Include any information, such as photographs, newspaper accounts, damage surveys, substantial damage determinations, homeowner receipts for repairs, or NFIP claims information.	

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2.2 STEP 2: GATHER HAZARD INFORMATION FOR THE PROJECT AREA	
2.2.1 NFIP Flood Hazard Data	
Information regarding flood hazards can usually be obtained from the NFIP maps for the community in which the project is located. Floodplain boundaries and flood elevations are shown on the FIRM for the community. Additional information, including flood profiles (a graph showing the relationship of the water surface elevation of a flood event to a location along a body of water) and supporting technical information, may be found in the accompanying FIS. FIRMs and FIS reports may be obtained through the FEMA Map Service Center at **www.msc.fema.gov** or by calling a toll free number at **800-358-9616**.	
FISs and FIRMs provide information regarding the 100-year flood, also known as the base flood, which is the flood having a 1 percent chance of being equaled or exceeded in any given year. On FIRMs, the 100-year floodplain in areas where riverine flooding sources have been studied by detailed methods is designated Zone AE (or on older maps, the designation may be a numbered A zone, such as "Zone A1"). The 100-year floodplain in coastal areas is designated Zone VE (or as a numbered V zone on older maps). FIRMs may also show the Base Flood Elevation (BFE), which is the expected elevation (relative to a datum, usually sea level) of the 100-year flood.	The proposed project location, the Creekside subdivision in southwestern Adversity, has gently sloping overbanks through which McDermott Creek flows before reaching its confluence with the Quake River. The land adjacent to the creek is approximately 5 feet above normal (non-flood) creek level. The 100-year floodplain is approximately 100 to 200 feet wide in the project area. The effective Flood Insurance Rate Map (FIRM) for the project area is from the Flood Insurance Study (FIS) for the City of Adversity, CID No. 006006. The project area is shown on Panel 0010C, dated March 6, 1994 (See attached FIRM). The FIRM shows 100- and 500-year floodplain boundaries for McDermott Creek in the vicinity of the Creekside subdivision.

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If BFEs are shown on the FIRM, the corresponding FIS may contain profiles of the 10-, 50-, 100-, and 500-year flood elevations for the flooding source in question. Using features such as bridges and lettered cross-sections that are labeled on the profile, it is possible to measure to a location on the profile adjacent to the project area and read the BFE from the profile. To determine the distance a structure may be located from a road or bridge, measure the distance on the FIRM along the centerline of the river and then find the corresponding location on the flood profile. This is an acceptable method for obtaining a BFE.	Base Flood Elevations (BFEs) in the area of the subdivision range from 102 to 110 feet NGVD.
The FIRM may also show a floodway for the flooding source. The floodway designates the portion of the 100-year floodplain that represents the area of highest conveyance and flow velocity, and therefore the area that poses the greatest risk for flood damage. If a property is located in a floodway, this fact should be noted in the application.	The FIRM also shows a FEMA-designated floodway for McDermott Creek in the vicinity of the Creekside subdivision. The floodway is not confined to the existing earthen channel. As stated above, five of the residences in question are located within the floodway.
If a floodplain is simply designated "Zone A" (for riverine areas) or "Zone V" (for coastal areas), it was determined by approximate methods, and therefore does not have a corresponding BFE on the map. In such cases, it is necessary to develop flood hazard data for the project location.	
The following data should be submitted with the application:	
• A copy of the FIRM with FIRM title block, including the NFIP CID number, effective date, and panel number and suffix. The FIRM should be copied at the same scale as other maps of the project area. The applicant should	See attached FIRM (at same scale as original FIRM) and copy of local topographic map (based on an aerial survey from April 1997) with project site marked in red on each map. There are no previous or pending FEMA map revisions requested

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determine if the community has requested a change to these maps that has not yet been incorporated, and if so, whether the change would affect the area under consideration.	for McDermott Creek.
• A copy of the FIS profile with the location(s) of the proposed channel project clearly marked. In cases where local flooding or ponding appear on the FIRM, it is likely that the flood hazard was identified by approximate methods, and no flood profile exists.	A copy of the flood profile from the FIS for the City of Adversity (Panel 022P, dated March 6, 1994) for the McDermott Creek is attached. The profile has been marked in red to show the upstream and downstream boundaries of the project site.
• The data used to develop the BFE if the floodplain was determined by approximate methods on the FIRM. The BFE should be used to delineate the corresponding floodplain on the topographic map for the project area. For riverine areas studied by approximate methods, it may be necessary to prepare a discharge at a project location. To determine the discharge of a river at a given location, a hydrologic model, such as a rainfall-runoff model; or a simplified method, such as use of U.S. Geological Survey (USGS) regression equations, can be used. To determine the flood elevations for the stream, hydraulic models or other normal depth calculations can be used. A qualified professional engineer or hydrologist must prepare this information.	
• An analysis of the channel's effects on flood hazards. This analysis must include hydrologic and hydraulic information from a qualified engineer or hydrologist identifying changes in flood elevations and discharges. Specifically, this analysis should identify the extent to	The attached engineer's report contains a hydraulic analysis comparing pre-project and post-project conditions. The analysis uses the 100-year flood discharges provided in the effective FIS. Results of this analysis are summarized below in the discussion of Executive Order 11988 and are discussed in detail in the attached

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which flood hazards are reduced, backwater effects, and effects to areas downstream of the project site.	report.
2.2.2 Flood History	
The applicant should document the history of flooding problems in the project area. Essential information includes date(s) of flooding events, flood characteristics, flood location, extent of flooding, and cost of damage. Other key data include:	Many residents in Adversity live on or near flood hazards, and approximately 1,500 property owners have suffered flood damage since records have been kept. Approximately 500 property owners suffer damage or fight rising waters regularly (every 5 to 10 years). Most recently, the McDermott Creek flooded in March 2002, causing substantial damage to 20 residential properties in the Creekside subdivision; the elementary school located in the subdivision, and additional residences located along the creek at various intervals upstream. Due to Adversity's proximity to flood hazards, the community has experienced flooding on an average of once every 3 to 5 years for over half a century. Additionally, the citywide cost of damage from each flood event is increasing from an average of $2.4 million between March 1939 and February 1970, to an average of $14.4 million between March 1970 and March 2002. (See the attached FIS for a more detailed history of the flooding.)
• Flood elevation, discharge, and flood frequency data including the source and methodology used to determine the frequency. Also, include nearby high watermarks (if available) and any interior highwater marks that show the depth of flooding above the first floor elevation (FFE) in the structure(s).	Two floods exceeding the 100-year flood elevation of 110 feet have been recorded since 1939. The largest recorded floods in the vicinity of the Creekside subdivision, measured by high water marks on the 2nd Avenue Bridge located upstream of the subdivision, include (frequencies were estimated by a State hydrologist): **03/26/39** – Peak flood elevation of 99.5, 1,200 cfs, 25-year flood

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	04/05/54 – Peak flood elevation of 105, 2,500 cfs, 120-year flood **05/25/78** – Peak flood elevation of 103.5, 1,800 cfs, 60-year flood **12/01/84** – Peak flood elevation of 99, 1,100 cfs, 20-year flood **03/12/96** – Peak flood elevation of 100, 1,300 cfs, 30-year flood **03/28/02** – Peak flood elevation of 103, 1,700 cfs, 50-year flood
• Cost of damage to buildings, contents, and infrastructure (broken out by each of these three components, if possible).	**Note:** The amounts listed below represent estimate damages for the Creekside area, adjusted to current dollar values (combined buildings, contents, and infrastructure). **03/26/39** – Reported damages of $600,000 **04/05/54** – Reported damages of $7,500,000 **05/25/78** – Reported damages of $2,800,000. **12/01/84** – Reported damages of $500,000 **03/12/96** – Reported damages of $800,000 **03/28/02** – Reported damages of $2,500,000
• Whether use of structures, public services, utilities, roads or bridges was lost, and if so for how long.	Average loss of public services is 3 days per event. The elementary school in Creekside was damaged and closed for the school year in 1954; and damaged and closed for an average of two months per occurrence in 1978, 1996, and 2002. The school was evacuated and closed for several days during the other flood events. Average loss of electricity, water, and natural gas is 7 days per

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	event. The 2nd Avenue bridge was closed during the 1954 flood but was not damaged.
• Depth-damage functions (that is, percent damage of the building replacement value at each flood depth) for the structures to be protected, if available. The FEMA FIS may provide historical flood information. However, other potential sources of this information include: • Association of State Flood Plain Managers (ASFPM), (www.floods.org) • National Weather Service (NWS), (www.nws.noaa.gov) • Natural Resources Conservation Service (NRCS), (www.nrcs.usda.gov) • U.S. Army Corps of Engineers (USACE), (www.usace.army.mil) • U.S. Bureau of Reclamation (BOR), (www.usbr.gov) • U.S. Geological Survey (USGS), (www.usgs.gov) • State water resources agencies. **Note:** The Federal agency website addresses above are for the agency national headquarters. The websites contain links to agency offices or districts within individual States. The	The depth damage functions in the FEMA Riverine Full Data BCA module are representative of the damages for this project.

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ASFPM website contains mitigation information and links to State NFIP Coordinating offices (which may also have useful flood data) and State agencies.	
2.3 STEP 3: DEVELOP ALTERNATIVE SOLUTIONS TO THE PROBLEM FEMA will evaluate the project for feasibility and cost-effectiveness, and the applicant must describe why the proposed project is the best solution to the problem. In addition, because the project will be considered for funding under a Federal program, it will be subject to review under the National Environmental Policy Act (NEPA) and Executive Order 11898, both of which require that any reasonable alternative be evaluated along with their impacts. Consequently, the applicant should document the alternatives that were considered for meeting the purpose and need for the project. NEPA and other environmental requirements are further discussed on Section 2.7 of this document.	**Solution #2: Structure Elevation** Elevation would reduce the flooding problem for the residences if each house were raised above the BFE for that property. This would solve some of the problem of property damage by moving much of the homeowner's real and personal property out of the path of the flood. Because elevation would not be a viable option for the school, the school would be floodproofed to prevent water from entering the structure during high water events. However, some of the properties that would be eligible have suffered damage from floodwaters up to 6 feet. Many of the eligible houses are rather large and are built of brick and concrete. The size, building materials, and required elevation heights will increase the average cost of raising these homes. The elevation option would reduce, but not eliminate, the risk of both physical danger and property damage. Rapidly rising waters could still trap residents, causing the need for emergency evacuation. Utility lines would still be required for decent and sanitary living. Additionally, although floodproofing would protect the school building, the City would nonetheless have to evacuate the structure prior to flooding for the safety of the building occupants and so that shields can be installed in doorways. Therefore, it remains likely that the City, State, and Federal governments will repeatedly be asked to spend funds on emergency response measures and repairs to damaged infrastructure.

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	An appropriate estimate for elevating a medium-sized brick or concrete slab house is $30,000. It would cost approximately $450,000 to raise the 20 houses in question, considering their varying sizes and variations in building materials. Rescue services and utility repairs can cost up to $500,000 per event. Assuming one event every five years, and assuming disaster and repair services cost from $100,000-$500,000 per event, over a project lifetime of 100 years, these services would total approximately $6,000,000.
Typically, at least three alternative solutions to the problem should be considered. One of the alternatives should be the proposed channel construction project. The analysis should also consider the "no-action" alternative; this alternative reflects conditions that would exist if no further action were taken. For example, what would be the consequences if the flood hazard in the area was not reduced? Finally, consider at least one additional feasible alternative. For example, could the structures in question be elevated above the BFE to protect them from flooding?	Solution #3: No Action Calculations based on the history of flooding in Adversity indicate that, with no action, the Creekside area could expect to suffer further damage, injury, or death of even greater magnitude in the future. Assuming property owners would collect a similar amount of disaster assistance every five years, and assuming a 35-year lifetime of the project, the no action alternative could result in future disaster assistance payments of approximately $5,250,000 over the next 35 years. The No Action option does nothing to reduce or eliminate future risk to city residents or damage to their property or to protect the school, and it does not offer a means to reduce or eliminate the need for future disaster assistance.
For each alternative, consider the local hazard mitigation goals, the project cost, economic benefits, potential for repetitive losses, environmental impacts, and public health and safety risks. Document alternatives that are feasible and	

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would be used if the proposed alternative were to become unavailable and provide an evaluation of the advantages and disadvantages of each. Also list any other alternative considered but eliminated from further evaluation.	

2.4 STEP 4: PREPARE A BENEFIT-COST ANALYSIS

A BCA is FEMA's method for determining whether a proposed project is cost-effective, and therefore, a viable option for flood mitigation. It is recommended that a preliminary BCA be completed using rough estimates of the project costs and benefits to evaluate the project. Once a detailed scope of work had been determined, a more thorough and precise BCA should be prepared using specific data. A complete BCA is required for all FEMA-funded mitigation projects.

The BCA is completed using the flood hazard information and flood history for the project area, the values at risk from flooding (that is, the value of benefits obtained by completing the project), and the estimated project costs. All information used to prepare the BCA must be documented, including data sources, dates, assumptions, and analysis procedures. Data from recognized sources such as FEMA FISs, the U.S. Geological Survey (USGS), the U.S. Army Corps of Engineers (USACE), the Natural Resources Conservation Service (NRCS) and state agencies have a high degree of credibility. When local data are used, supporting documentation from an engineer or other qualified source must be submitted.

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The following information presents general guidance regarding the application of BCAs to channel construction projects. More detailed information regarding BCAs may be obtained from the FEMA website at **www.fema.gov/fima/pdm.shtm** or by obtaining the *FEMA Mitigation BCA Toolkit CD*, dated January 2005. FEMA has also established a BCA Helpline, which can be reached through a toll free number **866-222-3580**, or by email at **bchelpline@dhs.gov**. Along with the BCA for the project, the applicant should include a completed Data Documentation Template (DDT) to support the values used in the BCA. The DDTs are available on the *FEMA Mitigation BCA Toolkit CD*, dated January 2005. Generally, applicants use a FEMA-approved software-based BCA to determine the cost-effectiveness of projects. The pilot alternate methodology applies to all FEMA Mitigation Grant Programs including: FMA, HMGP, PDM, and Supplemental Mitigation Grants. Projects submitted for consideration under any of these programs must adhere to all requirements set forth in the various governing statutes and program regulations.	

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2.4.1 Using FEMA's BCA Modules	
FEMA has developed software and guidance to prepare BCAs in accordance with agency requirements. The BCA software involves modules for different hazards, including floods. Applicants are encouraged to use the FEMA BCA software to ensure that the calculations and methods are standardized. Alternative BCA software may be used only if approved by FEMA in advance of submitting an application based on the alternative software.	The standard FEMA Riverine Full Data BCA module was used for all BCAs associated with this project.
Many of the FEMA BCA modules contain typical or default data. Use of such data is acceptable as long as the data are applicable to the channel construction project being proposed. Several of the modules are applicable for channel construction projects.	The default values in the FEMA Riverine Full Data BCA module were used in the analyses for this project.
The **Riverine Limited Data Module** is a frequency-damage module that can be used for areas without quantitative flood hazard data, such as areas outside of mapped floodplains on the FIRM, areas studied by approximate methods, or situations where lowest floor elevation data are not available. The information needed to complete this module may include, but is not limited to:	
• Documentation of event frequency.	See the information cited in Flood History and the attached copies of the effective FIRM and FIS flood profiles, which have been marked in red to show the property locations.
• Damage and losses in high frequency events (1- to 10-year recurrence interval); moderate frequency events (10- to	See the information cited in Flood History and the attached copies of City and State damage estimates.

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK
50-year recurrence interval); and low frequency events (greater than a 50-year recurrence interval).	
• Damages or losses with high value. Possible sources of information include damage surveys, substantial damage determinations, homeowner receipts for repairs, and NFIP claims amounts.	The damages were not broken out as high or low damages.
• Estimates of deaths and injuries due to flood events.	There were no deaths and documentation for the injuries is explained under the "Benefits" category below. The values used for injuries were in accordance with the guidance provided on the *FEMA Mitigation BCA Toolkit CD*, dated January 2005.
The **Riverine, Coastal A-Zone, and Coastal V-Zone Full Data Modules** use quantitative data to determine the frequency and severity of flood events, and engineering data to calculate damages and losses before and after mitigation. Given the proper input data, the results are more accurate than those obtained with the Limited Data Module. Common data inputs may include, but are not limited to:	
• Building data for structures to be protected by the project, including:	See the summary table for structure data. Elevation data for structures in the Property Inventory were either obtained from the Elevation Certificates on file or by licensed land surveyors for this project. Replacement values are estimated based on tax assessor's data.
o Type of building (residential, commercial, public).	
o Building size (area in square feet).	
o Building replacement value or BRV ($ per square feet).	
o Replacement value of contents and the method used	The replacement value for contents is estimated at $750,000

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK
for determining the value. The standard FEMA value for residential structures is 30 percent of the BRV of the structure, or a minimum of $20,000, whichever is greater. Contents values that exceed 30 percent should include documentation, such as homeowner receipts for replacement contents.	(approximately 28 percent of the total damages from the 03/28/02 flood event).
o Lowest floor elevation (excluding basement, unless the basement is a fully-finished, livable space), and lowest adjacent grade to the structure. Ideally, FEMA Elevation Certificates should be prepared by a state Licensed Land Surveyor (LLS) or a state registered Professional Engineer (PE). If these elevations are estimated from available sources, the community must document the way in which the estimate was derived and submit the documentation.	
• Flood elevation data (typically 10-, 50-, 100-, and 500-year flood elevations), which can be found using the flood profile in the FIS or in other acceptable sources of flood information from the USACE, NRCS, USGS, or state water resources agencies.	See the information cited in Flood History and the attached copies of the effective FIRM and FIS flood profiles, which have been marked in red to show the property location.
• Flood discharge data, which can be found in the FIS or obtained from other Federal or state agencies.	See the information cited in Flood History and the attached copies of City and State damage estimates.
• FEMA Elevation Certificates or other elevation documentation, certified by a LLS or a registered PE should be provided as support data for all FFEs. The LLS or PE must be licensed in the State where the proposed project will occur.	FEMA Elevation Certificates that provide the FFEs are included for all structures involved in the proposed project.

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK
• Depth-damage functions (if BCA default data are not used).	The default BCA values for the depth-damage function were used.
• The amount of damage, as a percentage of the pre-event building replacement value (BRV) that would result in demolition. The standard amount of damage used in a BCA, for structures not on the National Registry of Historic Structures, is 50 percent. Values other than 50 percent must be documented and justified.	The BCA analysis uses the standard figure of 50 percent as the amount of damage per structure that would result in demolition.
• Displacement times and costs for displaced tenants (if default values are not used).	The average displacement time for the 20 structures in this project was 18 days during the 1996 flood and 25 days during the 2002 flood.
• Net business income (if the building houses commercial activities).	No residences in the Creekside subdivision function as businesses or public/non-profit agencies.
• Annual operating budget (if the building houses public/non-profit services).	
2.4.2 Preparing the BCA	
Considerations for preparing the BCA are described below. It should be noted that net social benefits and total costs (both Federal and local share), as opposed to the benefits and costs to the Federal Government, should be the basis for evaluating whether a project is cost-effective. Therefore, all social benefits would be considered for minor structural flood control projects, not just benefits for Repetitive Loss properties.	

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK
2.4.2.1 Benefits The benefits of channel construction are equivalent to the avoided damages, losses, and casualties that would occur if the residents continued to occupy the structures. For example, if the project area has been flooded 10 times, and the roads, public utilities, and homes have been repaired or replaced each time, then containing flow within the channel will remove the need to repair and replace these structures in the future. Examples of common benefits include avoided (or reduced): • Damages to the structures and contents, including public buildings, commercial structures, and residences; as well as damage to nearby roads and other infrastructure serving the residences. • Displacement costs incurred by residents living elsewhere while homes are repaired. • Emergency response costs for police, fire, and other public services when the residences are flooded. • Removal of debris from streets and public areas such as municipal parking lots and recreation areas. • Loss of utility services to the residences, as well as repairs to damaged utilities. • Economic losses resulting from displacement of	The benefits claimed for residential structure and contents damages, displacement costs, emergency response costs, removal of debris from streets and other public areas, damaged utilities, damage to the school, costs for relocating students to other school buildings, and injuries (there were no deaths) are documented with the attached benefits data. The data followed the guidance from the Data Documentation Templates on the *FEMA Mitigation BCA Toolkit CD*, dated January 2005.

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK
commercial or light industrial uses of the structures. • Deaths and injuries. Casualty benefits cannot be counted for flooding, except in flash flooding or dam failures, because residents are usually given sufficient warning time to evacuate their homes. Refer to the Mitigation BCA Toolkit for current statistical values for deaths, major injuries, and minor injuries.	
"Multiplier" effects cannot be counted. A multiplier effect is an indirect or secondary benefit. For example, if channel construction creates opportunities for the development of park facilities that ultimately attract visitors, the economic benefits to the community from the visits cannot be counted, as they are not a direct effect of the project.	The City has determined that the BCA does not reflect secondary benefits.
2.4.2.2 Project Costs All costs should be reflected in the project SOW. Only costs that are relevant to the implementation of the project should be counted in the total project cost. Project costs should:	
• Include all costs associated with channel construction. Costs to be included in the estimate are described in more detail in Section 2.6 below.	A detailed breakdown of the project costs is attached. All costs are relevant to the project (per guidance from the FEMA Regional Office).
• Be based on a reasonable estimate – that is, there should be no obvious over- or underestimate of the true cost of the project. If construction will be completed using a contractor, all elements of the contractor's costs, including overhead and profit, should be included.	

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK
• Be calculated using present-day dollars. • Reflect current project information. • Be well documented and from a credible source. • Reflect the total project cost, not just the FEMA share. 2.4.3 Cost-Effectiveness As with all mitigation projects, a channel construction project is considered cost-effective if the ratio of benefits to costs is 1.0 or greater. FEMA does not fund projects with a benefit-cost ratio (BCR) less than 1.0. Some States may use the BCR as a ranking factor for selecting projects to submit to FEMA for funding when the number of projects is greater than the available funds. When used as a ranking factor, a project with a higher BCR is considered to be more cost-effective than a project with a lower BCR. If there is more than one BCA submitted for the project, the applicant should include a calculation page showing how the overall project BCR was calculated. The project BCR involves dividing the total benefits from all project components by the total costs for all project components.	

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK
2.5 STEP 5: PREPARE A SCOPE OF WORK FOR THE PROJECT The scope of work serves as the basis for FEMA's review of eligibility, feasibility, and cost-effectiveness, and establishes the framework for expenditure of grant funds. The scope of work should include all elements for implementation of the project, from design through project completion.	
2.5.1 Define the overall scope of work Provide a description of the scope of work for the project.	The City proposes to implement the following as Solution No. 1: The existing channel of McDermott Creek consists of a trapezoidal earthen channel constructed in the 1930s. The approximate channel bottom width is 25 feet, and the approximate top-of-bank is 7 feet above the channel bottom. The current channel is highly degraded, with eroded banks, sediment deposits, and vegetation. The City proposes to replace the existing earthen channel with a lined rectangular channel for a reach 2,900 feet long between the limits of construction identified above. The modified channel will be built within the alignment of the existing channel. It will have a bottom width of 30 feet and a bank height of 7 feet.
2.5.2 Include specific elements The scope of work should reflect the following: • **Planning and design:** Includes completion of property surveys, structure elevation surveys, channel surveys,	The City will hire an engineering consultant (or retain the current consultant) to accomplish the following:

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK
technical analyses (such as hydrologic and hydraulic analyses), engineering drawings, special provisions, and detailed cost-estimating. The community should identify the first floor elevations for any structures protected by the proposed project. Section 60.3 of the NFIP Regulations requires that a Conditional Letter of Map Revision (CLOMR) be prepared and submitted to FEMA for approval when proposing modifications to detailed areas (numbered Zone A or Zone AE areas) of the SFHA. Use of a consultant for this work should be identified.	• Conduct preliminary surveys, confirm easement boundaries, and install staking for the project. • Refine hydrologic and hydraulic analyses and prepare data to be used for requesting a Conditional Letter of Map Revision prior to construction and a Letter of Map Revision after construction is complete and as-built data is available. • Produce engineering drawings and specifications. • Prepare a detailed cost estimate. • Submit a CLOMR application to FEMA for the proposed channel project.
• **Obtain easements and secure permits:** If the channel to be modified is on property that does not belong to the applicant, or if the channel is to be relocated to such property, it may be necessary to obtain an easement. This process may require surveys and legal support.	The channel will be installed within the easement provided to the City for the initial channel construction in the 1930s. The surveyors will confirm the easement boundaries, as described above.
The scope of work should also account for analyses and reports needed to secure permits, such as wetlands delineations required for a Section 404 permit from the USACE; a state channel modification or water quality permit; and compliance with state environmental process laws.	The City has already obtained a permit under Section 404 of the Clean Water Act. However, the City must obtain a Streambed Alteration Agreement from the State Water Quality Control Board. The consultant will pursue this permit and conduct any analyses required. The consultant will also coordinate the City's involvement in any environmental review performed by the state or FEMA.
• **Prepare bid package and obtain contractor:** Specifications developed in the steps above will be used to	The consultant will prepare the bid package and assist the City with contractor selection.

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK
prepare bid documents and select a contractor. If a consultant will be used to oversee the bid process, the applicant should include that fact in the scope.	
• **Complete construction:** The scope of work should reflect all facets of construction, including: o Site access, storage, staging, and security o Site preparation o Temporary construction requirements, such as a coffer dam to allow de-watering of the stream bed, access roads and borrow areas o Earthwork, including importation or disposal of fill o Installation of the channel lining, such as reinforced concrete o Installation of grade structures, scour protection, and other appurtenances o Related work to bridges or other features related to the channel o Fencing and landscaping o Mitigation measures required for compliance with environmental laws o On-site project management	Construction will have the following elements. • Establish a staging site at the city property adjacent to the 2nd Avenue Bridge; install security fencing; and install temporary utilities. Once construction is completed, this property will be restored to pre-construction condition. • Clear the existing channel of vegetation and obstructions. • Excavate the existing channel and shape channel cross section. • Concrete rubble masonry (CRM) walls with a base width of approximately 5 feet and a top width of approximately 1 foot 6 inches. • Channel bottom consisting of a PVC-coated gabion mat having a thickness of 1 foot 6 inches. The mat will be placed over 6 inches of crushed bedrock. • Drainage system consisting of 12-inch geotextile filter to line channel walls, 6-inch diameter PVC pipe to allow drainage through the channel walls, and ¼-inch brass screen mesh to protect pipe openings. • Reinforced concrete cutoff walls to protect the 2nd Avenue Bridge footings from scour. • Dewatering of the stream through placement of earthen coffer

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK
o Construction inspection When the project involves a modification to an identified SFHA, a Letter Of Map Revision (LOMR) is required. Section 60.3 of the NFIP regulations requires that after as-built data is available, a LOMR request be prepared and submitted to FEMA for approval. • Prepare operation and maintenance plan: FEMA cannot pay for operation and maintenance of a facility under a hazard mitigation grant. However, the design of the facility must include an operation and maintenance plan to ensure the long-term effectiveness of the project. The responsible entity must be identified, along with the schedule and estimated annual cost. • Submit Letter of Map Revision detailing the new hydrologic and hydraulic data.	dams and pumping of excess water as necessary. Silt fencing and pump screens will be installed according to state permit requirements. • Backfill of channel walls with compacted earth, and seeding the top layer of fill. • A 6-foot high chain link fence that will run the length of the channel on both sides, preventing public access to the channel. • Construction inspection, performed by the City's consultant. • Preparation of as-built plans by the City's consultant. • When as-built data are available, submission of a LOMR application to FEMA to update the FIRM. The City public works department will assume responsibility for channel maintenance once the channel is operational. Maintenance includes: • Removal of woody debris and litter every six months; • Removal of accumulated silt every three years; and • Annual inspection of channel elements. The annual maintenance budget is set at $25,000.

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK
2.6 STEP 6: PREPARE A COST ESTIMATE AND SCHEDULE	
2.6.1 Cost Estimate	
The application must be accompanied by a cost estimate for completion of the project. Cost data must be provided for each of the items identified in the scope of work above. An example cost estimate is attached.	
The applicant may determine the appropriate source for cost data. Possible sources includes: • Historical data for similar projects completed by the applicant or neighboring communities. • Engineer's cost estimates, based on the design for the project. • Commercially available cost information, such as cost data published by R.S. Means. • Cost data available from a state or Federal agency responsible for similar projects, such as the U.S. Army Corps of Engineers.	The cost estimate is based on an estimate prepared by the City's engineering consultant. The estimate is based on a preliminary design for the project. The consultant used the City's historical information on costs for infrastructure projects to develop this estimate. The total estimated cost for the project is $1,092,046. The cost estimate is attached.

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK
The cost estimate should reflect the expected actual costs for completing the project. For construction to be completed by a contractor, all costs that would make up the contractor's bid for the project should be included. Consequently, the cost estimate should reflect the following: • "In-place" unit costs – that is, unit costs that reflect labor, equipment, and materials for installation. • The construction contractor's on-site costs (also referred to as mobilization), such as temporary utilities, field supervision, site security, and quality control. • An estimate for the contractor's overhead and profit. • The applicant's costs for managing the project, overseeing construction, conducting construction inspections, and preparing "as-built" plans. • Environmental and historic preservation mitigation costs. The cost estimate cannot include a factor for contingencies. Additionally, FEMA cannot provide funding for the applicant's administrative costs.	
Prior to accepting grant funds and initiating work, the applicant must establish a financial tracking system for incoming grant funds, local matching funds, and payments for services.	A copy of the City's initial spreadsheet for tracking finances is attached.

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK
In addition to estimating project costs, the applicant must identify potential sources of funding for the project. The mitigation grant will cover 75 percent of project costs. Matching funds from other sources must be obtained.	Matching funds will be obtained from the City's public works and infrastructure budget; the City Council has approved this expenditure.
2.6.2 Schedule	
A schedule for completing the work must be submitted with the application. This schedule must include time frame for all actions described in the Scope of Work, from preliminary design through operation of the completed channel. The duration of each phase of the project should be identified. The schedule may be presented in terms of time frames following certain activities; for example, bids will be accepted from construction contractors within one month of completion of design work. An example schedule is attached.	The project will be completed within 18 months of the award of the grant. A schedule is attached.

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK

2.7 STEP 7: CONSIDER ALL ENVIRONMENTAL AND HISTORIC PRESERVATION IMPACTS

2.7.1 National Environmental Protection Act (NEPA)

NEPA requires FEMA to evaluate the effects of its actions and actions it funds, on the natural and human environments. FEMA must also ensure that its actions comply with all other applicable Federal environmental laws and regulations, such as the Endangered Species Act and the National Historic Preservation Act (NHPA). Although FEMA is responsible for ensuring Federal-level compliance, the applicant must provide information required for the compliance process. The applicant is also responsible for ensuring that the project complies with applicable State, tribal, and local environmental laws and permitting requirements.

Specific considerations are outlined below. The information requested is the minimum required, and should not constrain applicants from providing more information where potential impacts are identified. Lack of documentation may delay completion of FEMA's review or cause the application to be declined.

For purposes of environmental and historic preservation review, the applicant should not only evaluate the potential impacts of the project itself, but also of any associated construction activities, such as temporary access roads, staging yards, borrow areas, and site restoration or remediation. All costs associated with avoidance and minimization measures must be included in the project cost

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK
estimate (see Step 6). As part of the NEPA environmental review FEMA has determined that certain categories of action normally have no significant effect on the human environment and, therefore, can be categorically excluded from the preparation of environmental impact statements and environmental assessments except if extraordinary circumstances as defined below. The following are exclusion categories that might be relevant to channel construction type projects: iii. Studies that involve no commitment of resources other than manpower and funding. (Level 1) iv. Inspection and monitoring activities, actions to enforce standards or regulations. (Level 1) vii. Acquisition of properties and associated demolition/removal when the acquired property will be dedicated in perpetuity to uses that are compatible with open space, recreational, or wetland practices. (Level 2) ix. Acquisition, installation, or operation of utility and communication systems that use existing distribution systems or facilities, or currently used infrastructure rights-of-way. (Level 2) xi. Planting of indigenous vegetation. (Level 1) xii. Demolition of structures and other improvements or disposal of uncontaminated structures and other	

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK
improvements to permitted off-site locations, or both. (Level 2) xv. Repair, reconstruction, restoration, elevation, retrofitting, upgrading to current codes and standards, or replacement of any facility in a manner that substantially conforms to the preexisting design, function, and location. (Level 2) xvi. Improvements to existing facilities and the construction of small scale hazard mitigation measures in existing developed areas with substantially completed infrastructure, when the immediate project area has already been disturbed, and when those actions do not alter basic functions, do not exceed capacity of other system components, or modify intended land use; provided the operation of the completed project will not, of itself, have an adverse effect on the quality of the human environment. (Level 3) The documentation required varies depending on whether the CATEX is a Level 1, Level 2, or Level 3. Level 1. The project file should indicate the CATEX for which the project or action qualifies and justification, if necessary. Level 2. Requires indication and justification of the specific CATEX(s) being used. Also requires an indication that there are no extraordinary conditions or, where appropriate, documentation of consultations.	

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK
Level 3. CATEX requires full review, consultation and documentation as appropriate and as described in the NEPA Desk Reference for: • National Historic Preservation Act and • Archeological & Historical Preservation Act; • Endangered Species Act; • Farmlands Protection Policy Act; • Section 404 of the Clean Water Act; • Executive Orders 11988, 11990, 12898; • Any other environmental laws and executive orders if they apply and; • Extraordinary circumstances If one or more of the following extraordinary circumstances exist and may be impacted by the project, the project may no longer qualify as a CATEX and an Environmental Assessment will need to be prepared. (i) Greater scope or size than normally experienced for a particular category of action; (ii) Actions with a high level of public controversy; (iii) Potential for degradation, even though slight, of already	

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK
existing poor environmental conditions; (iv) Employment of unproven technology with potential adverse effects or actions involving unique or unknown environmental risks; (v) Presence of endangered or threatened species or their critical habitat, or archaeological, cultural, historical or other protected resources; (vi) Presence of hazardous or toxic substances at levels which exceed Federal, state or local regulations or standards requiring action or attention; (vii) Actions with the potential to affect special status areas adversely or other critical resources such as wetlands, coastal zones, wildlife refuge and wilderness areas, wild and scenic rivers, sole or principal drinking water aquifers; (viii) Potential for adverse effects on health or safety; and (ix) Potential to violate a Federal, State, local or tribal law or requirement imposed for the protection of the environment. (x) Potential for significant cumulative impact when the proposed action is combined with other past, present and reasonably foreseeable future actions, even though the impacts of the proposed action may not be significant by themselves.	

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK
2.7.2 Historic Properties: Structures	
Under Section 106 of the National Historic Preservation Act, FEMA must consider the effects of its finding on buildings, structures, sites, districts, and objects that are listed or eligible for listing on the National Register of Historic Places. Consultation with the State or Tribal Historic Preservation Officer (SHPO/THPO), other consulting parties and the public is required as part of this consideration.	
Even if the property is not listed on a National Register, FEMA must evaluate properties, typically 50 years or older, for their historic significance and determine whether the property is eligible for listing in the National register. The applicant should provide information to FEMA supporting this evaluation.	
Determine if any of the structures adjacent to or within close proximity to the proposed channel construction project are potentially historic, or if the channel lies adjacent to a historic district. Consider bridges and other infrastructure as part of this evaluation. The preferred source of information to determine the original age of a structure is a review of building permit data, engineering documents, or tax or land records. The SHPO/THPO, relevant local government agency, historic commission, or historical society may be contacted to obtain information on identification of structures, local or State surveys and the presence of historic districts encompassing or adjacent to the proposed channel construction sites.	None of the structures (including the residences and the school) in the Creekside subdivision is 50 years or more in age, nor do any of the structures have historic significance. The subdivision is not considered an historic district. The SHPO concurred with this finding (letter attached).

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK
If any nearby structures are over 50 years old or located within a known or potential historic district provide: • The property address, date of original construction, and source of documentation for each structure. • At least two color photographs showing at least three sides of the structure. If outbuildings are present, such as a separate garage or barn, provide photographs of two sides of these structures as well. • Documentation associated with the structure being listed or determined eligible for listing on the National Register of Historic Places. • A detail of the property location (s) or proximity to a historic district on 1:24,000 scale USGS topographic map. • Documentation of coordination with the SHPO/THPO or other parties.	

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK
2.7.3 Historic Properties: Archaeological Resources and Historic Sites Consideration of effects to historic properties is not limited to buildings and other built-environment features. Previously undisturbed or agricultural areas may also be significant, either because archaeological resources may exist at the site or because the site is in an area where a historic event occurred, including sites significant to Native Americans. Determine if the channel construction requires ground-disturbing activities. If so, provide documentation of: • The area of the disturbance on a 1:24,000 USGS topographic map, including dimensions and location, and site maps. • Past uses of the area to be disturbed, including the results of a literature search to determine if known archaeological sites exist in the area. • Coordination with the SHPO/THPO or other parties.	There is low probability that prehistoric or historic archaeological resources are located in the project area. While there are several documented archaeological sites on the same landforms in surrounding areas, the project will be implemented within the current and historic banks of the creek. Historic erosion is likely to have eliminated any possible sites. According to the SHPO (see letter dated 05/05/04 in Attachments), the project should have no effect on archaeological resources as long as excavation and earthwork are confined to the stream banks in this manner.

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK
2.7.4 Endangered Species and Biological Resources	
Under Section 7 of the Endangered Species Act (ESA), FEMA must evaluate the effects of its actions on federally listed threatened and endangered species and their habitat. While channel construction projects are often undertaken in urban areas that are unlikely to have suitable habitat for listed species, any project dealing with rivers and streams must be carefully evaluated for potential impacts on aquatic species and species associated with riparian habitat. Additionally, aspects of a project such as access roads and staging may have effects on nearby biological resources that should be evaluated. The applicant can speed the review process by obtaining species information and initiating contact with appropriate State wildlife agencies, the U.S. Fish and Wildlife Service (USFWS) and, if ocean-going fish are affected, with the National Marine Fisheries Service (NMFS). However, any formal consultation with Federal agencies must be handled by FEMA. Another law that addresses waterways and associated species with a particular interest in the effects brought about by changes in hydrology is the Fish and Wildlife Coordination Act. Since this act is also overseen by the USFWS and NMFS, it should be handled at the same time as the ESA.	
Potential effects on biological resources should be evaluated if aspects of the project: • Are located within or adjacent to (typically within 200 feet) a body of water, such as a perennial, intermittent, or	McDermott Creek is a perennial stream. The existing channel of the creek was modified in the 1930s and consists of a highly degraded earthen cross section that is periodically maintained by the City. The channel banks are also highly eroded and overgrown with weeds. Areas adjacent to the channel consist of landscaped back

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK
seasonal stream; drainage swale; seasonally wet area; pond; lake; creek; or coastal waterway. • Result in the removal of vegetation. • Are located within or adjacent to identified critical habitat for federally listed species known to occur in the project area; locations of critical habitat can be obtained from the USFWS and NMFS. • Affect the hydrology or hydraulics of the waterway. If biological resources have the potential to be affected, submit: • A map showing the nearby water body, its dimensions, the proximity of the project to the water body, and the expected and possible changes to the water body, if any. Identify all water bodies regardless whether there may be an effect. • Documentation and map showing the amount and type of vegetation affected. Discuss the presence of critical habitat or other significant feature with Federal or State wildlife agencies before undertaking extensive fieldwork or mapping. • Documentation of species in or near the project area. • Documentation of coordination with the USFWS or NMFS, or both, regarding the potential occurrence of	yards of nearby residences, as well as the parking lot and lawns of the school. Information regarding the presence of federally listed threatened and endangered species was obtained from the U.S. Fish and Wildlife Field Office. The project area does not fall within designated critical habitat, nor does the project area contain suitable habitat for threatened or endangered species known to be present in the vicinity. See the attached species list obtained from the U.S. Fish and Wildlife Service.

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK
federally listed species and potential impacts to species. If a reviewing agency suggests redesign of the project or use of measures to reduce effects on species, the application scope of work, budget, and project decision-making description should address the suggested changes.	
2.7.5 Clean Water Act and Protection of Wetlands Waters of the United States and designated wetlands are protected through the Federal Clean Water Act (CWA) and through Executive Order 11990, Protection of Wetlands. Applicable resources include creeks, streams, ponds, lakes, and coastal waterways and include seasonal as well as perennial bodies of water. Channel construction projects almost always affect Waters of the United States. Permits for work in waters of the United States are issued by the USACE under Section 404 of the Clean Water Act. The applicant is also responsible for obtaining any permits required under State law such as the CWA section 101 water quality certificate and the National Pollution Discharge Elimination System (NPDES) permit. If channel construction involves excavation, fill placement or other modifications to water bodies or wetlands, submit:	As stated above, McDermott Creek is a perennial stream, and the channel project will be undertaken within Waters of the United States.
• Documentation of coordination with the USACE regarding potential for wetlands, and applicability of permitting requirements.	The City has obtained a permit from the USACE under Section 404 of the Clean Water Act; a copy of the permit is attached. Additionally, the City has applied for a Streambed Alteration Agreement from the State Water Quality Control Board.
• Map showing the relationship of the project to National	

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK
Wetlands Inventory information or other available wetlands delineations. • Documentation of the alternatives considered to eliminate or minimize impacts to wetlands. For example, if earthwork during site remediation could result in silt-laden runoff, water quality could be affected; a plan for reducing erosion and runoff should therefore be included. • Documentation that applicable permits have been applied for or obtained at time of project application.	Mitigation measures required as part of the application for the Streambed Alteration Agreement are attached.

2.7.6 Floodplain Management

Executive Order 11988, Floodplain Management, states that each Federal agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities for (1) acquiring, managing, and disposing of Federal lands, and facilities; (2) providing federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities. In accordance with Executive Order 11988, FEMA must ensure that its actions avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of floodplains. By definition, removal of floodprone structures from the floodplain is consistent with the requirements of this

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK
Executive Order.	
The project application must include an analysis of the effects of the channel project on flood hazard data as described in Step 2. This analysis must include hydrologic and hydraulic information from a qualified engineer or hydrologist identifying changes in discharges and flood elevations. Specifically, this analysis should identify: • Extent to which flood hazards are reduced; • Backwater effects (if any); • Potential scour; and • Effects to areas downstream of the project site.	As stated above, the attached engineer's report contains a hydraulic analysis comparing pre-project and post-project conditions. The analysis uses the 100-year flood discharges provided in the effective FIS. Through a comparison of the pre- and post-project conditions, the City has determined that the channel will reduce BFEs by an average of 1.5 feet, contain the 100-year flood through the project area, and reduce the width of the FEMA-designated floodway. Additionally, the effect of the channel on discharges was evaluated. While the efficiency of the channel will be improved, the channel downstream of the project area is wide enough to provide sufficient storage for the increased flow; therefore, increased overbank flooding and increased scour of the channel and banks are not likely.
Executive Order 11988 prohibits FEMA from funding construction within the FEMA-designated floodway, unless the work can be classified as a "functionally dependent use." However, the Executive Order prohibits funding for projects in the floodway that increase BFEs. A channel modification project is considered a functionally dependent use, but it must have the effect of reducing BFEs.	The project will reduce the FEMA-designated floodway and will reduce BFEs.
The application must document consultation with the USACE under Section 404 of the Clean Water Act.	As stated above, the City has obtained a 404 permit from the USACE.
The application must also document coordination with the corresponding State agency, if applicable, with jurisdiction over modification of waterways.	Additionally, the City has applied for a Streambed Alteration Agreement from the State Water Quality Control Board.

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK
Under the NFIP regulations, a community is required to request a Letter of Map Revision (LOMR) from FEMA for the FIRM in cases where flood hazard data shown on the FIRM has changed. The community must request this revision within six months of the change (after all construction and site restoration have been completed). Therefore, if a channel project affects the flood hazard data shown on the FIRM, the community must request a revision to the FIRM to reflect this change.	The channel modification project will reduce BFEs, the 100-year floodplain, and the boundaries of the FEMA-designated floodway. The City will request a LOMR from FEMA once the project is completed and the as-built data are available.
### 2.7.7 Coastal Zone Management Act	
Under the Coastal Zone Management Act, FEMA must ensure that its actions are consistent with the approved State Coastal Zone Management Plan. If the channel construction project is located in the State's designated coastal zone, the applicant must obtain a permit or clearance letter from the appropriate State agency that implements the Coastal Zone Management Plan or attach documentation regarding application of coastal zone management requirements to the channel construction project.	The project area is not located within a coastal zone.
### 2.7.8 Coastal Barrier Resources Act	
The Coastal Barrier Resources Act (CBRA) was designed to protect barrier islands along the East Coast, Gulf of Mexico, and Great Lakes. The law prohibits Federal funding for construction of any new structure or appurtenance on barrier islands. Also, no new flood insurance coverage may be provided on or after October 1, 1983, for any new construction or substantial improvement of a structure located	

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK
in a Coastal Barrier Resources System (CBRS). Therefore, the structure must be relocated outside of the CBRS.	
2.7.9 Hazardous and Toxic Materials	
Potential contamination and environmental liability may present concerns for applicants proposing channel construction projects. Contamination may result from previous uses of the property on which the channel will be constructed, or from upstream sources that have degraded water quality. FEMA must ensure that the applicant takes steps to dispose of hazardous or toxic materials properly when they are encountered during construction.	The project does not involve hazardous or toxic materials.
Site contamination may be of concern if: • Current or past land uses of the property or the adjacent properties are associated with hazardous or toxic materials. • Studies, investigations, or enforcement actions exist for the property.	
If contamination is suspected: • Provide any relevant documentation regarding the contamination. It may be necessary to conduct an Environmental Site Assessment to formally identify hazardous materials concerns. • Consult with the appropriate State or local agency to obtain permit and requirements for handling, disposing of,	

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK
or addressing the effects of hazardous or toxic materials.	
2.7.10 Effects on Minority and Low-Income Populations	
Executive Order 12898, Environmental Justice, requires Federal agencies to identify and address, where appropriate, adverse human health, environmental, economic, and social effects when they disproportionately affect minority or low-income populations. The Executive Order also directs Federal agencies to avoid excluding persons from receiving the benefits of programs because of their race, color, or national origin. Further, Federal agencies are encouraged to integrate this Executive Order with the NEPA process to identify potential effects and related mitigation measures in consultation with affected communities. Consequently, the effects of channel projects that are undertaken in communities with a high proportion of minority or low-income residents must be evaluated. If adverse disproportional effects are caused by a channel project, it would be necessary to determine if the conditions of this Executive Order are triggered.	The project area does not contain a high percentage of low income or minority residents. Further, it is the position of the City that channel construction will benefit all residents by reducing the flood threat to homes; and will benefit families by protecting the elementary school.
Two conditions are indicators of the presence of minority or low-income population: 1) if the community is predominately minority or low income or 2) if the demographic profile of the area impacted by the channel project has a significantly higher minority or low income percentage than the surrounding area which is not impacted. A third factor to consider is whether the affected population has a high proportion of limited-English speakers. These conditions can be evaluated using data collected by the U.S. Census Bureau or by local entities such as social services agencies or redevelopment authorities.	

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK
If there are adverse effects from the project and these adverse effects occur under either of the first two conditions described above, then there are disproportionate impacts which must be addressed. If adverse effects are evenly distributed among a population there are no disproportionate high and adverse effects and the Executive Order is not triggered. If the Executive Order is triggered, it is necessary to communicate with the affected population to determine what mitigation measures can be taken to minimize or avoid the adverse impacts. In areas where a high proportion of the affected persons are limited-English speakers, public notices, public documents, and other key communication tools must be translated to ensure participation by limited-English speaking persons.	
2.7.11 Land Use and Socioeconomic Effects Under NEPA, the potential effects of the channel construction project on the community must be evaluated. Determine if the project will:	
• Disrupt the physical and economic arrangement of an established community. For example, will the aesthetics of the community be affected?	The channel modifications will be visible from nearby homes. However, the overall effect of the change will be minimized by the fact that the modified channel will follow the current alignment; and the current channel was modified in the 1930s and continues to reflect those changes. A fence will be constructed along the banks of the channel to limit access during high flows.
• Affect fire or police protection, schools, maintenance of public facilities, or other governmental services.	The channel will have no effect on public services, other than to reduce the need for emergency services during floods and eliminate

PROCEDURES	SAMPLE DATA FOR THE SCOPE OF WORK
	the need to close the school.
• Interrupt utilities and service systems. For example, what costs are associated with relocation of utilities that might be affected by a relocated channel?	The channel will have no effect on utilities.
• Be consistent with the zoning and the general plan of the jurisdiction. It may be necessary to adopt changes to zoning ordinances to accommodate the change in land use, including a change in the FIRM.	The channel is consistent with zoning and general plan requirements.

(FROM STEP 6): SAMPLE COST ESTIMATE AND SCHEDULE

Cost Estimate

Item	Units	Unit of Measure	Unit Cost	Cost
Access, staging, and storage	1	LS	$31,680	$31,680
Clearing and grubbing	2	AC	$4,500	$9,000
Mass excavation	10,741	CY	$4.00	$42,964
CRM walls	3,759	CY	$80.00	$300,720
Gabion mattress	4,833	CY	$48.72	$235,464
Backfill – crushed rock	1,611	CY	$32.06	$51,649
Geotextile fiber material	3,867	SY	$6.41	$24,787
Brass mesh	600	SY	$4.00	$2,400
PVC drainage pipe – 6 inch diameter	2,320	LF	$2.75	$6,380
Concrete cutoff wall	15	CY	$600.00	$9,000
Channel dewatering, including required mitigation measures	1	LS	$60,000	$60,000
Backfill – embankment	6,000	CY	$2.50	$15,000
Chain link fence – 6 feet high	5,800	LF	$6.00	$34,800
Item A Subtotal of base costs				$823,844
Item B Mobilization [5% of Item A]				$41,192
Item C General contractor's overhead/profit [15% of (Items A + B)]				$129,755
Item D Cost escalation to midpoint of 24-month grant approval/design/construction period [1.5% of (Items A + B + C)]				$14,922
Item E City management of design, permitting, bid and construction [3% of (Items A + B + C + D)]				$30,291
Item F A&E consultant costs for design, permitting, bid, and construction [5% of (Items A + B + C + D + E)]				$52,000
Total Cost Estimate				**$1,092,004**

Schedule

Task	Estimated time to complete
Grant approval by state and FEMA	6 months
Procure A&E consultant to complete design/permitting	1 month
Complete working drawings	3 months
State Water Quality Control Board issues permit	2 months
Prepare bid package, solicit bids, and select contractor	2 months
Mobilization	1 month
Construction	6 months
Final inspection and as-builts	3 months
Total Time Estimate	**24 months**
Some tasks may overlap or occur simultaneously.	